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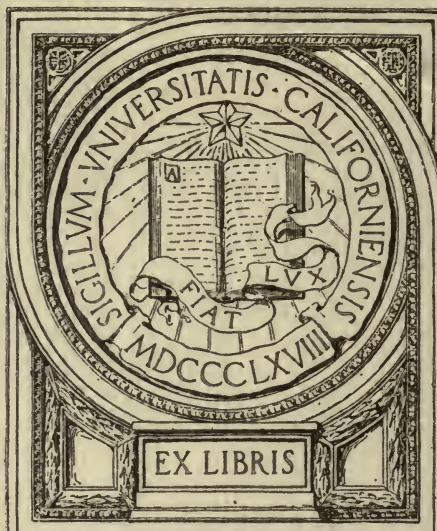

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DESCRIPTION AND INSTRUCTIONS FOR CARE AND OPERATION

OF

FIRING MAGNETOS

TYPES GA AND MA

(TWO PLATES)

MARCH 10, 1917

WASHINGTON
GOVERNMENT PRINTING OFFICE
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U.S. Ordnance dept.

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WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ORDNANCE,
Washington, March 10, 1917.

This manual is published for the information and government of the Regular Army and National Guard of the United States.

By order of the Secretary of War:

WILLIAM CROZIER,
Brigadier General, Chief of Ordnance.

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DESCRIPTION AND INSTRUCTIONS FOR THE CARE AND OPERATION OF FIRING MAGNETOS.

1. The firing magnetos described below have been developed to replace the firing pistol and battery used on seacoast gun carriages and the D. C. magneto used for firing mortars.

MAGNETO TYPE GA, FOR GUNS.

(Plate I.)

2. For gun firing, type GA is used. This magneto is designed for firing one primer only, and is issued for all guns using separate ammunition.

3. The magnetos are numbered serially, the first 100 having a base differing slightly from those of higher number. Numbers 1 to 100 have two threaded lugs on the base through which the old-style firing cable with spiral armor passes. By means of a gasket, nut, and sleeve, the cable is made fast to the base.

4. Numbers 101 and following have a single entrance provided in the base for the twin conductor leaded and armored firing cable.

5. The principal parts of this magneto are: Case with base, firing lever, lever catch, lever spring, spring plunger and spring lever, lever shaft, gear segment, clutch-shaft pinion, clutch shaft, clutch-shaft bracket, clutch and spring, clutch-shaft gear, armature-shaft pinion, and magneto proper. The parts are named approximately in their order in the train from lever to magneto.

6. The firing magneto, complete, weighs 33 pounds.

7. The case is of bronze, and protects the interior from dust and excessive moisture. By means of a lug at the rear it is securely attached to the bracket provided on the sight standard.

8. The firing lever is heavily constructed to resist bending under excessive strain. It is held in the locked position by a catch, and when the lever is gripped preparatory to firing the catch is automatically released. The lever is returned to the locked position by the lever spring, assisted by the weight of the lever itself. It has been found that it is not necessary to raise the lever violently, as even a small and slow movement will fire a primer. The gear ratio is such that one complete revolution of the lever would give 48 revolutions of the armature. As the lever can be easily moved at the rate of one

turn in a second, it is seen that very high armature speeds may be obtained. When the lever is raised, the gear segment on the far end of the lever shaft turns the combination pinion and clutch. The latter, through the clutch sleeve, turns the clutch shaft and the large gear on the other end of this shaft meshing with the pinion on the armature shaft. The pinion on the clutch shaft is extended through the clutch shaft bearing and has on its inner end ratchet teeth. These are normally in mesh with the teeth on the clutch sleeve. The sleeve slides free on a flat section of the shaft, but must turn with it, and is held in mesh with the pinion by a spring. Thus, when the lever is raised, the armature is revolved, and when the lever stops the clutch teeth slide over each other, the spring allowing the sleeve to back off from engagement with the pinion clutch. The armature is thus allowed to revolve until its momentum is lost and sustain the current.

9. This magneto will deliver on open circuit about 45 volts at 2,000 r. p. m. Through an external resistance of 1 to 3 ohms, it will, at 2,000 r. p. m., generate about 0.8 ampere at 1 volt pressure. Small external resistances do not greatly affect the output and a primer can be fired with as much as 60 ohms resistance in the circuit. The armature and brush resistance is about 3 ohms.

10. The average current being about 0.8 ampere it will be ample to fire one primer. However, the capacity is in general not sufficient to fire in parallel, since about 0.4 ampere or more is necessary to fire a primer. As the resistance of the firing circuit is less than 1 ohm it is seen that while a large number of primers might be fired in series, only two could be fired in parallel, under favorable circumstances. The magneto should not therefore be expected to fire more than one primer except in series.

11. The magneto proper is made by the Sumter Telephone Manufacturing Co., and is their type JR. The armature is wound with 530 to 540 turns of No. 21 wire (B. & S.)

MAGNETO TYPE MA, FOR MORTARS.

(Plate II.)

12. This magneto is quite similar in principle and construction to the type GA, the capacity being considerably greater, however. It is designed to fire four primers in parallel and for this purpose the current output must be at least 1.5 to 2.5 amperes. In the branches of a divided circuit the greater portion of the current flows in the branches of least resistance. It is therefore desirable to have as great an output of current as practicable in excess of the necessary requirement in order to insure that all branches have the necessary current. It is also very important that the resistance in all branches be kept as nearly the same as possible.

13. The characteristics of this magneto are as follows: The voltage on open circuit is about 50 at 4,000 r. p. m. Through an external resistance of 2 ohms at 4,000 r. p. m. the output is about 8 amperes at 16 volts, and at 1,000 r. p. m., through the same external resistance, the output is about 4.5 amperes at 9 volts. The armature and brush resistance is 0.4 ohm.

14. The gear ratios are such that one turn of the firing lever causes 30 turns of the armature.

15. It is expected that four primers will fire simultaneously without great effort. In experimental firing, the primers have been found to explode upon a very small and relatively slow movement of the handle. When difficulty is experienced in firing all primers simultaneously, examination should be made to ascertain whether the branches of the divided circuit have approximately equal resistances.

16. The magneto, complete, weighs about 86 pounds.

17. The magneto proper is made by the Sumter Telephone Manufacturing Co. and is designated by them as type AGD.

18. A wall bracket is provided in or near each mortar pit for mounting the magneto, which is there attached to the engineer cables.

CARE OF MAGNETOS.

19. The construction of the magneto complete is very simple, and but little attention is required to keep it in good condition. All nuts are of the crown type held by a split pin to avoid unscrewing by vibration. The studs for the six nuts at the base are pinned in position.

20. When the magneto is not in use for extended periods it should be removed from the carriage, mount, or emplacement, if practicable, advantage being taken of this opportunity to examine the interior before storing.

21. The only attention required is examination of the interior approximately twice during the year to prevent starting of rust and to allow oiling of gears and bearings. Openings in the case for this purpose have been omitted for the sake of greater protection. To examine the interior, remove the nuts at the corners and sides of the base. The base, with magneto which is held to it by the remaining studs, can then be removed. There may be slight binding of the base on the studs so that it will be necessary to insert a thin tool between the base and the case in order to separate them.

22. The armature-shaft bearings are provided with grease pockets and these should be kept packed with waste soaked with light engine oil.

23. If difficulty is experienced in firing primers, it will probably be found that there is some irregularity in the firing circuit or magneto, and an examination should be made, rather than an attempt to over-

come the difficulty by violent raising of the lever. The lever should be raised with a moderately quick action and under proper conditions a relatively slow movement will fire the primer. The magnets should not be removed from the magneto frame unless absolutely necessary. To do so weakens the field and decreases the voltage. When the magnets are necessarily removed, they should be placed with the ends on pole pieces.

COVER FOR FIRING MAGNETO.

24. A cotton duck cover is provided with each magneto for protection against the weather when not in use.

TESTING LAMP.

25. There is provided a testing lamp for testing out the gun-firing circuit and magneto. It consists of a low-voltage incandescent lamp attached to a dummy primer. When this dummy is inserted in the vent, the firing circuit is closed in the usual manner. Upon operating the magneto the lamp will glow. If the circuit is in good condition the lamp will glow brightly, but the capacity is such that a current which will even produce a dull-red glow will fire a primer.

List of parts of firing magneto, their piece marks, number, and location.

TYPE GA.

Piece mark.	Number.	Name of part.	Location.
P67Q	1	Base (for use with flexible conduit)	Bottom of case.
P66G	1	Base (for use with armored cable)	Do.
P67P	2	Bushings	For base P67Q.
P67L	1	Case	Slips on magneto bracket.
P67S	1	Clutch	On intermediate shaft.
P67T	1	Clutch sleeve	Do.
P67X	1	Clutch-shaft bracket	Secured to armature yoke.
P61H	2	Gaskets, coupling	On conduit sleeves,
P67A	1	Gear	On intermediate shaft.
P67J	1	Intermediate shaft	In clutch-shaft bracket.
P67K	1	Key	Intermediate shaft.
P67C	1	....do	Lever shaft.
P67F	1	Key, Woodruff No. 1	Armature shaft.
P66K	1	Lever	On end of lever shaft.
P80E	1	Lever catch	On lever.
P66H	1	Lever-catch pin	Lever catch to lever.
P80F	1	Lever-catch spring	Riveted to lever catch.
P66C	1	Lever-return spring	Around spring plunger.
P66E	1	Lever shaft	In bearings in case.
P80D	1	Lever stop	Riveted to lever catch.
	1	Magneto, Sumter JR, or equal	Secured to base of case.
P66N	1	Nameplate	On front of case.
P61F	2	Nuts, coupling	Screw on bosses on base.
P67N	4	Nuts, crown	For studs P67M.
P67G	1	.....do	On clutch end of intermediate shaft.
P66F	1	.....do	On end of lever shaft.
P67H	1	.....do	On gear end of intermediate shaft.
P67E	1	Pinion	On end of armature shaft.
	2	Pins, dowel	In bottom of case for base.
	4	Pins	For studs P67M.
	2	.....do	For studs P66P.
P66D	1	Plunger pin	Connects spring plunger and spring lever.
	3	Rivets, countersunk	For fastening spring to lever catch.
P67Y	6	Screws, filister head	For fastening clutch shaft bracket.
	2	.....do	For nameplate.
P67B	1	Segment	On intermediate shaft.
P61G	2	Sleeves, conduit	In coupling nuts.
	1	Split pin	For plunger pin.
	1	.....do	For lever-catch pin.

List of parts of firing magneto, their piece marks, number, and location—Continued.

TYPE GA—Continued.

Piece mark.	Number.	Name of part.	Location.
P61G	1	Split pin	For nut P67H.
	1	do	For nut P67G.
P67U	1	Spring, clutch	On intermediate shaft.
P66A	1	Spring lever	Do.
P66B	1	Spring plunger	Between spring lever and lug on case.
P67M	4	Studs	Fasten base to case.
P66P	2	do	To hold magneto to base.
P66J	1	Washer	On lever-catch pin.
P67W	1	Washer, clutch	On intermediate shaft.
P67D	1	Washer	Do.

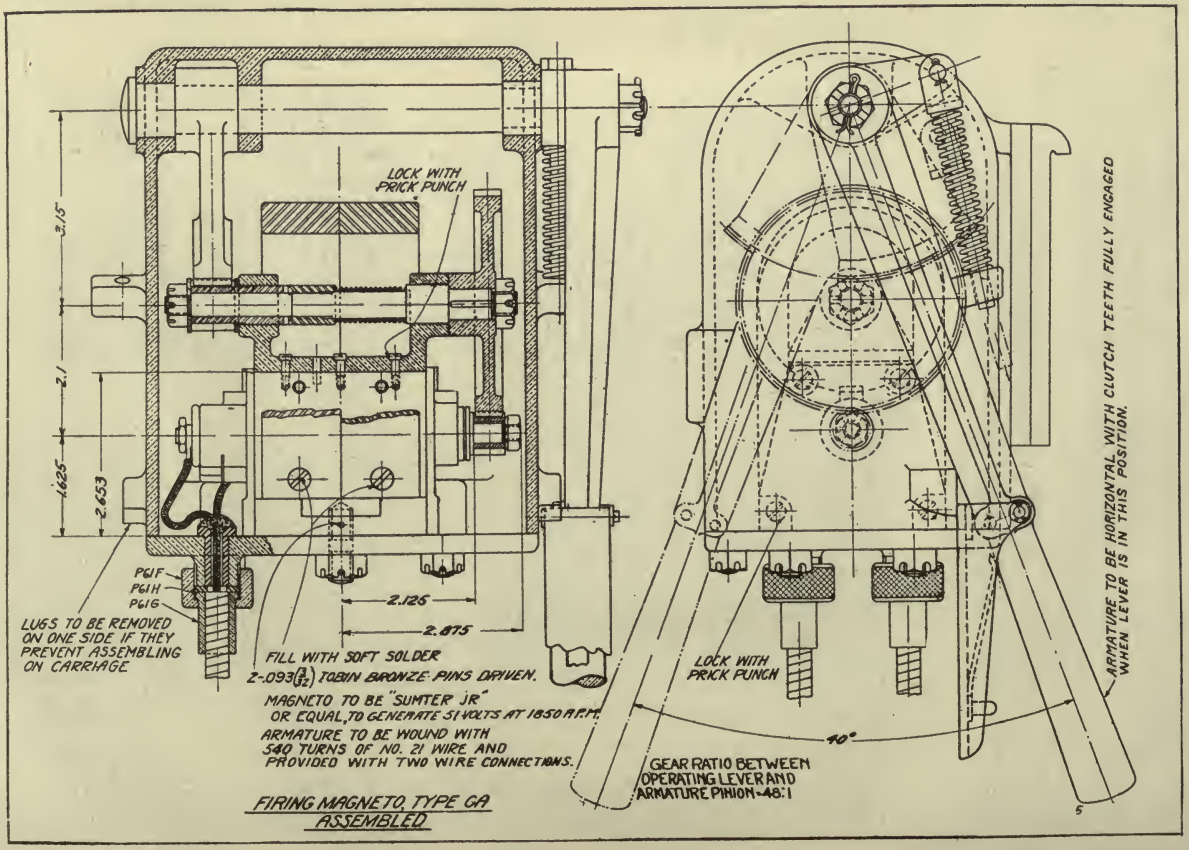
TYPE MA.

P74B	1	Base	Bolted to bottom of case.
P74A	1	Case	Slips on magneto bracket.
P76R	1	Clutch	On intermediate shaft.
P76K	1	Clutch sleeve	Do.
P76L	1	Clutch spring	Do.
T97P	1	Conductor terminal	Attaches to terminal end bracket.
T97Q	1	do	Do.
	2	Dowel pins	In bottom of case for base.
P76M	1	Intermediate gear	On intermediate shaft.
P76F	1	Intermediate shaft	In terminal end and pinion end bracket bearings.
P75A	1	Lever	On lever shaft.
P75E	1	Lever catch	On lever.
P75G	1	Lever-catch pin	Lever catch to lever.
P75F	1	Lever-catch spring	Riveted to lever catch.
P75B	1	Lever shaft	In bearings in case.
P75P	1	Lever stop	Riveted to lever catch.
P73E	1	Magneto, Sumter AGD, or equal	Bolted to base.
P73C	1	Magneto cable	From plug to terminals.
P73D	1	Magneto-cable plug	Connects to plug box.
P76N	1	Magneto pinion	On armature shaft.
P76P	1	Magneto-pinion key	Do.
P73A	1	Nameplate	On front of case.
P74G	4	Nuts, crown	For studs P74C.
P74E	6	do	For studs P74D.
P76G	1	do	For intermediate shaft.
P75C	1	do	For lever shaft.
P76H	1	do	For intermediate shaft.
P73F	1	do	For armature shaft.
	6	Pins	Secure studs (P74D) in case.
P76E	1	Pinion end bracket	Secured to pinion end of magneto.
	3	Rivets	For fastening spring to lever catch.
P73B	2	Screws, filister head	Fasten nameplate to case.
P76D	1	do	Clamps end of terminal end bracket.
P76C	1	do	Conductor terminal to terminal end bracket.
P76B	4	do	Pinion end bracket to magneto.
P76B	4	do	Terminal end bracket to magneto.
P75L	1	Segment	On intermediate shaft.
P75D	1	Segment spring	Between spring hanger and spring stud.
P75M	1	Segment key	In lever shaft.
	1	Split pin	For lever-catch pin.
	1	do	For spring hanger.
P75N	1	Spring hanger	On segment.
P74F	1	Spring stud	Screwed and riveted to inside of case.
P74C	4	Studs	Fasten magneto to base.
P74D	6	do	Connect base to case.
P76A	1	Terminal end bracket	Secured to terminal end of magneto.
T96EA	1	Terminal tube, complete	Screwed into base.
P75H	1	Washer	For lever-catch pin.
P75K	1	do	For spring hanger.
P76Q	1	do	For intermediate shaft.

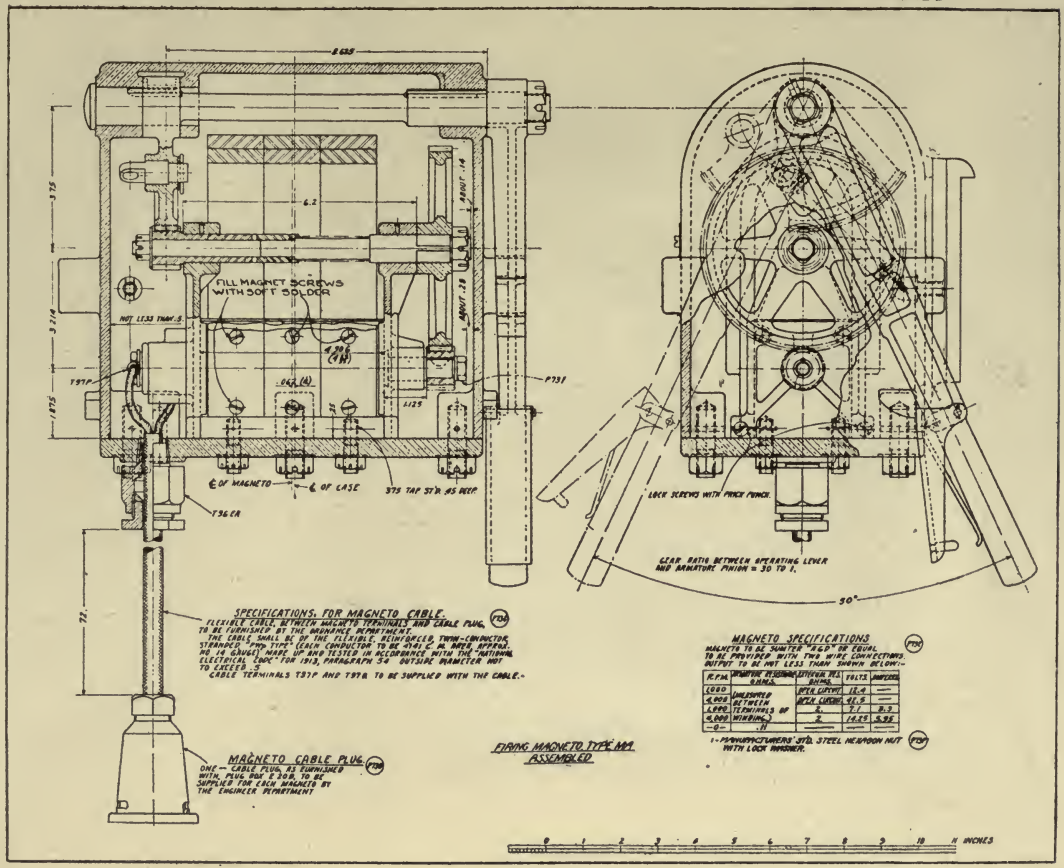
War Department,
Office of the Chief of Ordnance,
Washington, March 16, 1917.

Form No. 1814.
Ed. Aug. 27-17—500.

PLATE I


LOCK WITH PRICK PUNCH
3.15
2.1
1.625
2.653
P6IF
P6IH
P6IG
LUGS TO BE REMOVED ON ONE SIDE IF THEY PREVENT ASSEMBLING ON CARRIAGE
2.125
2.875
FILL WITH SOFT SOLDER
2-.093(3/32) TOBIN BRONZE PINS DRIVEN.
MAGNETO TO BE "SUMTER JR" OR EQUAL, TO GENERATE 5I VOLTS AT 1850 R.P.M.
ARMATURE TO BE WOUND WITH 540 TURNS OF NO. 21 WIRE AND PROVIDED WITH TWO WIRE CONNECTIONS.
LOCK WITH PRICK PUNCH
40°
GEAR RATIO BETWEEN OPERATING LEVER AND ARMATURE PINION - 48:1
ARMATURE TO BE HORIZONTAL WITH CLUTCH TEETH FULLY ENGAGED WHEN LEVER IS IN THIS POSITION.

FIRING MAGNETO, TYPE GA
ASSEMBLED



SPECIFICATIONS FOR MAGNETO CABLE.

FLEXIBLE CABLE BETWEEN MAGNETO TERMINALS AND CABLE PLUG. (T31A) TO BE FURNISHED BY THE ORDNANCE DEPARTMENT.
THE CABLE SHALL BE OF THE FLEXIBLE REINFORCED TWIN-CONDUCTOR STRANDED "7/24 TYPE" (EACH CONDUCTOR TO BE 7/24 C. M. BRED, APPROX. NO. 14 GAUGE) MADE UP AND TESTED IN ACCORDANCE WITH THE "NATIONAL ELECTRICAL CODE" FOR 1913, PARAGRAPH 54 OUTSIDE DIAMETER NOT TO EXCEED .5"
CABLE TERMINALS T37P AND T37A TO BE SUPPLIED WITH THE CABLE.-

MAGNETO CABLE PLUG. (T38)

ONE — CABLE PLUG, AS FURNISHED WITH PLUG BOX # 208, TO BE SUPPLIED FOR EACH MAGNETO BY THE ENGINEER DEPARTMENT

FIRING MAGNETO TYPE MM ASSEMBLED

MAGNETO SPECIFICATIONS

MAGNETO TO BE SUMTER "ASP" OR EQUAL (T31) TO BE PROVIDED WITH TWO WIRE CONNECTORS OUTPUT TO BE NOT LESS THAN SHOWN BELOW:-

R.P.M.	ARMATURE RESISTANCE BETWEEN BRUSHES	DIFFERENTIAL SPARK GAPPING	VOLTS	AMPERES
1,000	UNRESPARED	BETWEEN CENTERS	12.4	—
4,000	BETWEEN	BETWEEN CENTERS	42.5	—
4,000	TERMINALS OF	1	7.1	8.3
4,000	WINDING	2	14.25	5.95
-0-			—	—

1 - MANUFACTURERS STD. STEEL HEXAGON NUT WITH LOCK WASHER. (T37)

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